Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Hypervelocity Dust Injection for Plasma Diagnostic Applications[1] CATALIN TICOS, ZHEHUI WANG, LEONID A. DORF, GLEN A. WURDEN, Los Alamos National Laboratory — Hypervelocity micron-size dust grain injection was proposed for high-temperature magnetized plasma diagnosis. Multiple dust grains are launched simultaneously into high temperature plasmas at several km/s or more. The hypervelocity dust grains are ablated by the electron and ion fluxes. Fast imaging of the resulting luminous plumes attached to each grain is expected to yield local magnetic field vectors. Combination of multiple local magnetic field vectors reproduces 2D or even 3D maps of the internal magnetic field topology. Key features of HDI are: (1) a high spatial resolution, due to a relatively small transverse size of the elongated tail, and (2) a small perturbation level, as the dust grains introduce negligible number of particles compared to the plasma particle inventory. The latter advantage, however, could be seriously compromised if the gas load from the accelerator has an unobstructed access to the diagnosed plasma. Construction of a HDI diagnostic for National Spherical Torus Experiment (NSTX), which includes a coaxial plasma gun for dust grain acceleration, is underway. Hydrogen and deuterium gas discharges inside accelerator are created by a $\sim$ 1 mF capacitor bank pre-charged up to 10 kV. The diagnostic apparatus also comprises a dust dispenser for pre-loading the accelerator with dust grains, and an imaging system that has a high spatial and temporal resolution.

[1]An NSTX collaboration funded by DoE/OFES

Zhehui Wang
Los Alamos National Laboratory

Date submitted: 24 Jul 2005 Electronic form version 1.4